# Clinical infection services—the Leiden experience

*P. J. van den Broek[1] and S. J. Marshall[2]*

[1]Department of Infectious Diseases, and [2]Department of Clinical Pharmacy and Toxicology, Leiden University Medical Center, Leiden, The Netherlands

## INFECTION SERVICES AT THE LEIDEN UNIVERSITY MEDICAL CENTER

The Leiden University Medical Center (LUMC) is a hospital for tertiary medical care in The Netherlands. Annually, the hospital admits about 20 000 patients to its 867 beds. The mean stay is 9 days, while approximately 65 000 patients are seen in the outpatient departments. Three hospital departments are active in the field of infectious diseases: the Departments of Infectious Diseases, Medical Microbiology and Parasitology (Figure 1). The Department of Infectious Diseases is staffed by physicians trained in internal medicine and infectious diseases. Specialist training in infectious diseases takes 18 months and is officially recognized by the Dutch Society of Internal Medicine. The Department of Medical Microbiology has two subdivisions: bacteriology and virology. Medical microbiology is a laboratory-based speciality. Medical microbiologists are trained in diagnostic laboratory methods and advise clinicians about the diagnosis and treatment of infections. The Department of Parasitology is primarily research-oriented but supports the diagnosis and treatment of tropical disease.

Currently, the three departments provide four types of infection service to the hospital (Figure 1). An outpatient department and a specialist ward are run by specialists in infectious disease. The main focus of this service is the care of patients with congenital or acquired immunodeficiencies, such as hypogammaglobulinemia, chronic granulomatous disease, HIV and AIDS, and patients with chronic, recurrent or difficult-to-treat infections, such as bacterial endocarditis, empyema, abscesses, and late-stage Lyme disease. This service also has a facility for non-inpatient intravenous treatment.

The consultation service for infectious diseases at the LUMC began approximately 40 years ago, with one internist for consultations. Today, the service consists of two clinicians (one physician specializing in internal medicine, one specializing in the subspecialty infectious disease) and a team of four senior specialists (three consultants trained in infectious disease and one in medical microbiology). Outside working hours, a specialist in infectious diseases is available for emergency consultation. This provides a 24-h 7-day consultation service. Weekly case discussions with all those participating in the service ensures consistency in the recommendations given by members of the team. The antibiotic treatment recommendations of the service are published as the official antibiotic policy of the hospital. For some departments, e.g. the Hematology Department, specific protocols have been developed.

In addition to infectious disease consultations, the Department of Microbiology also offers recommendations on the diagnosis and treatment of infections. If appropriate, the two consultation services inform and interact with each other during the process of advising clinicians.

The fourth service is devoted to infection control. Infection control nurses play the most important role in this service. They are supported by a specialist in infectious diseases and a medical microbiologist who have particular expertise in the field of infection control.

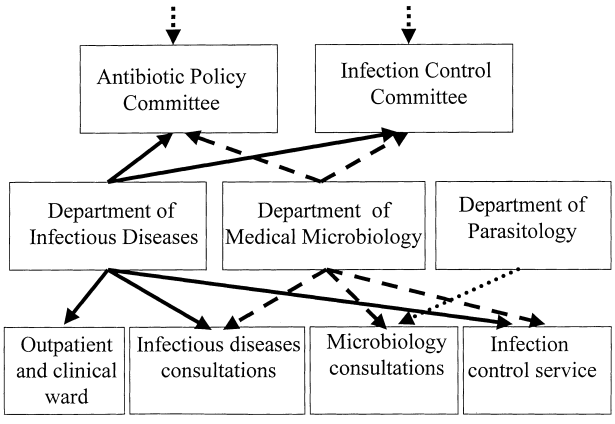


**Figure 1** Clinical infection services at the Leiden University Medical Center.

Corresponding author and reprint requests: P. J. van den Broek, Department of Infectious Diseases, Leiden University Medical Center, PO box 9600, 2300 RC Leiden, The Netherlands
Tel: +31 71 5262290
Fax: +31 71 5266758
E-mail: P.J.van_den_broek@Lumc.nl

**Table 1** Compliance with the hospital antibiotic protocol

| | No. of prescriptions | % of total no. of prescriptions |
|---|---|---|
| Complied with antibiotic protocol | 33 | 21 |
| Failure to comply with antibiotic protocol | 90 | 57 |
| Antibiotic therapy not warranted (e.g. no evidence of infection) | 11 | 7 |
| Insufficient information to audit | 25 | 15 |
| Total | 159 | 100 |

**Table 2** Summary of appropriateness of antibiotic prescriptions

| | No. of prescriptions[a] |
|---|---|
| Antibiotic therapy not warranted (e.g. no evidence of infection) | 11 |
| Incorrect choice of antibiotic for indication | 49 |
| Dose incorrect | 45 |
| Frequency of administration incorrect | 8 |
| Duration incorrect | 17 |
| Insufficient information to audit | 24 |
| Antibiotic not given | 1 |

[a]Prescriptions could be incorrect for one or more reasons.

The four services carry out hospital policy on antimicrobial therapy and infection control. Two committees, the Antibiotic Policy Committee and the Infection Control Committee, are responsible for the policy laid down in guidelines for antimicrobial treatment and infection control in the hospital. The membership of these committees comes from the Departments of Infectious Diseases and Medical Microbiology as well as representing other disciplines, such as pharmacy, surgery and pediatrics.

## GOALS

The goals of the four infection services are to provide and ensure optimal treatment of patients with infectious disease, prevent development of antimicrobial resistance in the hospital, control costs of therapy by maximum adherence to antibiotic policy, protect against hospital-acquired infection, and prevent the spread of resistant microorganisms by maximum compliance with infection control guidelines. Optimum treatment may not necessarily be the same as that recommended by the attending physician. It is the task of the services to balance the individual wishes of patients and doctors against the general concern of preventing the emergence of antimicrobial resistance, reducing costs and reducing the spread of hospital pathogens.

## PROBLEMS IN ACHIEVING THE GOALS AND CHALLENGES FOR THE FUTURE

The infection services in the LUMC face several problems in achieving their stated goals. Although the services are well equipped to promote adherence to the antibiotic policy of the hospital, their role in this respect is limited. Consultations are requested on a voluntary basis and there is a tendency to avoid requesting the assistance of the infectious disease consultation service. Currently, about 1000 consultations are requested annually, compared with 1300 4–6 years ago. As an example of poor consultation practice, a recent audit of the use of ceftazidime and teicoplanin showed that, depending on the department investigated, only 20–50% of the prescriptions were correct in terms of indication, dosage and duration of the course when judged by the antibiotic policy of the hospital (Table 1 and Table 2). Ceftazidime and teicoplanin are antibiotics which require authorization of the prescription by one of a selected group of specialists. The survey showed that stocks of ceftazidime and teicoplanin were present on the wards which had accumulated as a result of prescriptions for patients who did not complete the prescribed regimen. By using these stocks, 23% of treatments with ceftazidime or teicoplanin could be given without submitting the prescription to the pharmacy. Forty per cent of treatments were only partly cov-

**Table 3** Antibiotic prescribing policies: problems and solutions

| Problem | Solution |
|---|---|
| Non-adherence to antibiotic policy | Antibiotic order sheet<br>Stopping delivery of antibiotics<br>Feedback about assessment of prescriptions |
| Number of consultations/conflicting advice by specialist service | Formation of one unit for consultation |

ered by a prescription. Only half of the prescriptions for ceftazidime and teicoplanin were authorized in accordance with the guidelines.

To tackle these problems, a new system for control of the use of antibiotics has been developed (Figure 2). Antimicrobial drugs are divided into two groups, one available without restrictions and the other with restrictions. For the restricted drugs, an antibiotic order sheet has to be completed and sent to the pharmacy together with the prescription. The actual administration of an antimicrobial drug to a patient on the ward is registered by means of scanning a barcode on the packaging of the drug. When the pharmacy receives the order and the electronic administration registration, the stocks for the department are replenished. The antibiotic order is assessed by members of the Antibiotic Policy Committee, and feedback on this assessment is given to the prescribing physician.

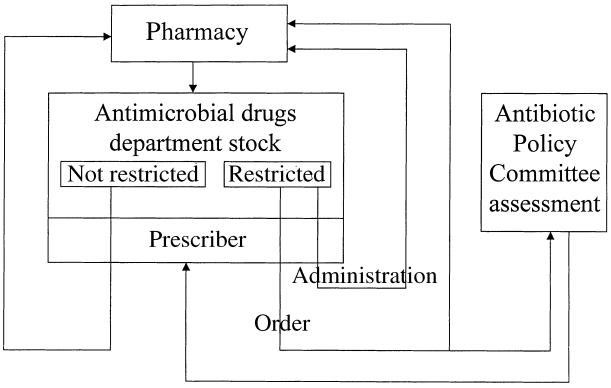


**Figure 2** System for the control of the use of antibiotics.

It is clear that the presence of two separate consultation services can cause problems (Table 3). The clinicians may seek advice from those who will give the answer they want to receive and they can create conflicts between the two services. A combined clinical and laboratory service in one center should hopefully prevent such problems and increase the center's influence on antibiotic therapy in the hospital.